

V.D.8 Hydrogen Fuel Project - H₂Fuel (New Project)*

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**Congressionally directed project*

Objectives

- Develop cradle-to-grave integration of the technologies for:
 - geothermal electrical energy production
 - hydrogen fuel production via electrolysis
 - storage, transmission, distribution, and dispensing of fuel
 - operations and maintenance of hydrogen powered transit vehicles in a real world fleet.
- Create a “green” fuel production and use cycle that utilizes renewable resources and results in low emissions of both criteria pollutants and greenhouse gases.
- Develop an integrated hydrogen fuel production and use process that is scalable and has reliability comparable to today’s mature fossil fuel technologies.
- Foster public and regulatory agency acceptance of hydrogen fuel technology as a safe, effective, and desirable path through extensive collaboration, education, and outreach.

Technical Barriers

This project addresses the following technical barriers from the following sections of the Hydrogen, Fuel Cells and Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan:

Hydrogen Generation by Water Electrolysis Barriers

- Q. Cost
- S. Grid Electricity Emissions
- T. Renewable Integration
- U. Electricity Costs

General (Cross Cutting) Hydrogen Production

- AC. High-Purity Water Availability

Hydrogen Delivery

- A. Lack of Hydrogen/Carrier and Infrastructure Operations Analysis
- E. Solid and Liquid Hydrogen Carrier Transport
- F. Transport Storage Costs

On-Board Hydrogen Storage

- E. Refueling Time
- G. Life Cycle and Efficiency Analysis
- J. Lack of Tank Performance Data

Off-Board Hydrogen Storage

- U. Codes and Standards
- V. Life Cycle and Efficiency Analysis
- W. Materials

Technology Validation

- A. Vehicles
- B. Storage
- C. Hydrogen Refueling Infrastructure
- D. Maintenance and Training Facilities
- H. Hydrogen from Renewable Resources

Safety

- A. Limited Historical Database for Components

Education

- A. Awareness
- B. Lack of Demonstrations or Examples in Real World Use

Approach

Based upon a technical and economic feasibility study previously funded by the Regional Transportation Commission, this project will construct, integrate, and operate a geothermal electrical generation facility to power a hydrogen fuel production facility utilizing electrolysis technology. The project will also construct, integrate, and operate facilities for gas storage, transmission, distribution, dispensing fuel, and maintaining hydrogen powered vehicles. A number of transit vehicles using various types of hydrogen powered propulsion systems will be operated and maintained under real world conditions. The H₂Fuel project also affords unprecedented opportunities for working with regulatory agencies on the development and integration of codes and standards across multiple technologies and areas of operation. Finally, the project will provide an experiment in public outreach and education on the use of hydrogen fuel on a community-wide scale.

In order to accelerate the research and development process, the project will acquire a number of hydrogen and hydrogen/compressed natural gas (HCNG) powered transit vehicles and construct a hydrogen/HCNG fuel dispensing station concurrent with the design and construction of the geothermal power and the primary fuel production facilities. Until the primary geothermal powered fuel production facility is on-stream, hydrogen will be generated from electrolysis units operating on grid power. Over the life of H₂Fuel, new hydrogen generation, storage, and propulsion technologies will be introduced into the project to maximize the breadth and value of the generated data.

In summary, H₂Fuel provides the nation a large scale, real-world facility for research and development of not only individual technologies and policies, but also the integration and interaction of these technologies and

policies. Experience and data generated by this research and development effort will be reported to the scientific and industrial communities on an on-going basis over the projected nine-year life of the project providing much needed data for addressing a number of the barriers identified in the “Hydrogen, Fuel Cells and Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan.”